Rice Diseases

UNITED STATES DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN NUMBER 2120

PREPARED BY SCIENCE AND EDUCATION ADMINISTRATION

CONTENTS

Revised April 1979

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
Stock Number 001-000-03882-6

RICE DISEASES

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Southern ricegrowers lose a substantial part of their crop every year because of rice diseases. In the four leading rice-producing States of the South—Arkansas, Louisiana, Mississippi, and Texas—diseases reduce the average annual yield by about 5 percent. This means an annual loss of more than 100,000 tons of grain. Similar percentages of the annual yield are lost through disease in States that grow rice on smaller acreages, including Missouri and South Carolina. In California, where much rice is grown, natural conditions are so favorable to this crop that its diseases have been less serious than in the southern rice area.

This publication discusses each disease that affects rice in the United States. It tells how losses from these diseases can be reduced through choice of varieties to grow, seed treatment, and methods of growing the crop. Table 1 (p. 18) lists the scientific names of organisms causing diseases and summarizes recommended control measures. Table 2 (p. 19) classifies rice varieties according to disease resistance and susceptibility. Contact your local county agricultural extension agents or professional seedsmen and applicators for current recommendations on chemical control of crop pests.

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PRINCIPAL RICE DISEASES

Seedling Blight and Seed Rot

Seedling blight causes stands of rice to be spotty, irregular, and thin from the time they are established. It results from the activities of various fungi, most of which grow on the kernels or hulls of seed rice or on soil particles. These fungi enter the germinating rice seed or young seedling and kill or injure it. If blighted seedlings emerge from the soil, they are likely to die soon thereafter. Those that survive generally are weak and yellowish. Figure 1 shows three seedlings affected with blight in contrast with one that is normal.

How widespread and severe blight becomes in a field of rice depends chiefly on (1) the percentage of seed infected by blight fungi, (2) soil temperature, and (3) soil moisture.

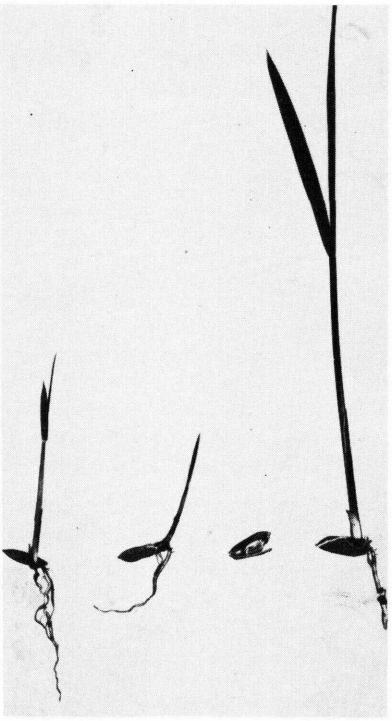

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Figure 1.—Three blighted rice seedlings and, at right, a healthy one.

Seedling blight is more severe on rice that has been seeded early, when the soil is cool and damp. (In Texas and Louisiana, the early seeding season is late February and March.) This disadvantage of early seeding partly can be overcome by seeding at a shallow depth. Conditions that delay the seedlings' emergence from the soil often favor seedling blight.

Seeds that carry blight fungi frequently show spots or discolorations on the hulls. Seed can be infested, however, and still appear clean. The fungus that causes brown leaf spot (see p. 6) also is a chief cause of seedling blight and is seedborne. A seedling attacked by this fungus shows dark areas on the basal parts of the first leaf.

Some blights that affect rice seedlings at germination can be controlled by treating the seed with chemicals. In extensive tests for treatment of rice seed, several chemicals gave stand increases. When using fungicides, carefully follow the manufacturer's directions regarding quantity to apply, method of application, and safety precautions.

If rice seed is to be sown early in the season, treating it may mean the difference between getting a satisfactory stand from the seeding and having to seed again. In experiments, seed treatment sometimes has doubled the density of the stand obtained. Little benefit results from treating rice seed that is to be sown late in the season, unless unfavorable weather conditions prevail at the time of seeding.

One soil-borne blight fungus, *Sclerotium rolfsii*, sometimes kills or severely injures large numbers of rice seedlings after they emerge if the weather at emergence is moist and warm. A cottony white mold develops on lower parts of the affected plants. This type of blight can be checked by immediately flooding the land. Seed treatment has little or no value for controlling it.

Seedling blight and seed rot of water-seeded rice are caused by primitive soil fungi known as water molds. These fungi kill the seedling after germination and produce a rusty-colored growth on the surface of the soil immediately around the seed. The fungi differ from those causing seedling blight on drill-seeded rice.

Blast

Blast (also called rottenneck) has caused serious losses in the Southern United States. It is caused by a fungus that produces narrow spindle-shaped lesions on leaves of young rice plants (fig. 2). These lesions usually have gray centers and brown to purplish-brown borders. In severe cases, the plants are stunted and lose nearly all their leaves or entire plants are killed. So-called leaf blast rarely is observed in the Southern United States, except in late-planted susceptible rice varieties with abundant nitrogenous fertilization. Leaf blast usually is most severe in newly cleared farmland and in fields that have been out of production for 5 years or longer. When young plants are attacked, development of the disease can be slowed by flooding or raising the flood.

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Figure 2.—The long, narrow spots on these rice leaves are typical of the fungus-caused disease known as blast. At right, a normal leaf.

More commonly, the rottenneck stage of this disease is observed. The blast fungus frequently attacks the neck of the panicle (fig. 3), sometimes preventing grains from filling or, for late infection, weakening the neck so that filled heads break off before the harvest. Infections also may occur at the nodes (joints) of stems or at the juncture of the flag leaf and sheath.

Afternoon showers and warm weather favor the development of blast. Probably the most critical factor in the Southern United States is the frequency of favorable dew periods. Although dew periods of 9 to 10 hours are sufficient for some infection to occur under usual field conditions, probably frequent dew periods of 12 to 14 hours or more are required for a serious outbreak to develop.

Blast is usually a greater problem on lighter soils than on heavy clay soils. In fields with blast disease, it is usually most serious in areas adjoining woods. These areas may have longer dew periods than parts of the field not shaded or protected from drying winds by trees.

Many U.S. varieties have resistance to prevalent races of the blast fungus. The resistances of most southern U.S. commercial varieties to major races of blast fungus, as well as other diseases, are summarized in table 2, page 19. The blast fungus race IG–1 is the most widespread and is particularly virulent on 'Nato' and 'Brazos'.

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Figure 3.—Rottenneck symptoms of blast.

Brown Leaf Spot

Brown leaf spot is a prevalent and serious disease in Texas and Louisiana. The fungus causing it is seedborne and attacks the seedlings and the leaves and heads of older plants.

Brown leaf spot may be evident from shortly after the seedling emerges until the plant matures. Spots are circular to oval (fig. 4) and are dark brown or gray. These spots vary in size, color, and appearance according to rice cultivar. Severe leaf spotting often is shown by plants in dense stands or other weak plants. On severely affected plants, the leaves, or large parts of them, die before maturity. Leaf spotting may reduce yield and quality of the grain.

Plants thus affected produce lightweight or chalky kernels. Spots similar to those on the leaves appear on the hulls and persist after the seed matures. Spots or stained areas also may occur on the kernels, reducing the quality of the grain.

Damage from brown spot can be lessened by maintaining good growing conditions for rice through—

- Balanced fertilizing.
- Crop rotation.
- Land leveling.
- Soil preparation.
- Cultural practices.

Seed treatments reduce the severity of seedling blight caused by this seedborne fungus.

Sheath Blight

Sheath blight is frequently an important disease of rice in the

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Figure 4.—Brown leaf spot, a prevalent and serious disease of rice.

Gulf States, particularly Louisiana. Large spots appear on the sheaths just above the waterline. These spots have irregular outlines and reddish-brown borders. The disease progresses rapidly at heading, spreading up the sheaths to the leaves, and killing the stem before seed-fill in severe instances (figs. 5 and 6). Plants weakened by sheath blight frequently lodge. This disease generally is spotty throughout fields, although under favorable conditions large areas of fields may be affected. Sheath blight is favored by warm moist weather, and plants in thick stands that retain moisture a large part of the day usually are most vulnerable.

This disease is caused by a soil-borne fungus. Sclerotia formed on diseased plants overwinter in the soil to infect rice or other grasses in succeeding seasons. Various wild grasses may serve as sources of inoculum. The same fungus recently has been found to cause a disease of soybeans. As soybean-rice rotations increase in the Gulf States, sheath blight may become the most important disease of rice in the South.

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Figure 5.—Sheath blight lesions on rice leaves.

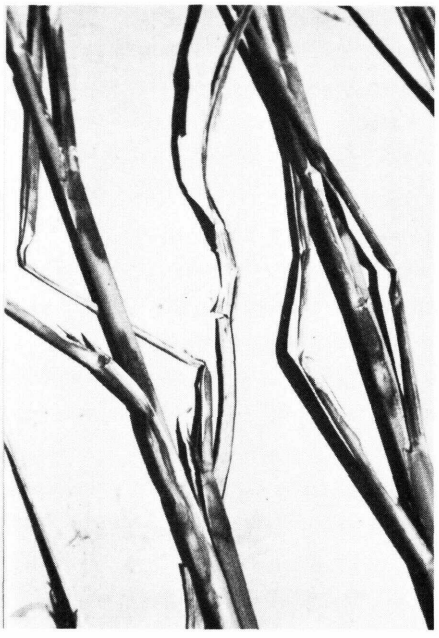

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Figure 6.—Sheath blight.

Rice varieties with some field resistance to sheath blight include several medium-grain varieties—Brazos, Nato, Saturn, and Vista; the short-grain varieties—Caloro, Colusa, and Nortai; and the industrial long-grain LA 110. All currently grown long-grain varieties are susceptible to sheath blight.

Stem Rot

Stem rot, caused by a fungus that lives in the soil, is an important rice disease in Arkansas, Louisiana, and Texas and frequently causes losses in California.

The first symptom is the appearance of irregularly shaped water-

soaked areas on the sheaths, at the waterline or slightly above it. These areas gradually turn black and enlarge. When the infection enters the stalks, dark masses of fungus growth develop, together with black or dark-brown streaks along the stalk. At more advanced stages, splitting the stalk reveals a cottony grayish mold inside.

When the rice approaches maturity, many small, black, seedlike bodies, called sclerotia, can be seen within split stalks (fig. 7) and in the rotting sheaths. At this stage the stalks break over and the plants lodge. Plants that are attacked early and are killed before they mature produce lightweight grain or almost no grain. Lodging resulting from stem rot often makes harvesting difficult. (Not all lodging of rice is due to stem rot.)

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Figure 7.—Stem rot. Splitting of a rice stalk has revealed black fungus bodies inside. (About 3 times natural size.)

The fungus causing stem rot often develops abundantly in rice stubble after harvest, even if little stem rot was present when the crop matured. This fungus lives in the soil and stubble in the form of sclerotia and may remain alive for 6 years. Certain wild grasses are susceptible to stem rot, and the infection may spread from them to rice.

No commercial variety of rice is highly resistant to stem rot. Because stem rot generally does not become prevalent until August or September, early maturing varieties escape serious damage if sown early.

Tests in Arkansas showed that application of potassium fertilizers to the soil reduced the severity of stem rot. Another control measure is to drain the water from the field at an early stage of sheath infection and keep the soil saturated, but not covered, with water until the rice almost has matured. Although the fungus can live in the soil for several years, crop rotations help to control it. Use of fertilizers containing nitrogen makes the plants more susceptible.

Root Rot

Root rot, as discussed here, includes several diseases or disorders in which the roots of young rice plants become deformed and discolored, then decay (fig. 8). As root decay progresses, the leaves cease to grow normally and turn yellow. Affected plants may die at any stage of growth.

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Figure 8.—Root rot.

Root rot may be caused by any one of several fungi. Rice roots also may be damaged by the feeding of nematodes and rice water weevils. Plants in saline or alkali spots generally grow poorly because they are infected with root rot.

Treating rice seed with chemicals as described under "Seedling Blight and Seed Rot" (p. 3) may prevent root rot and decay at the bases of stems of young plants. Topdressing a rice field with fertilizer containing nitrogen, phosphate, and sometimes zinc reduces root rot and improves yields in alkali spots.

Losses from root disorders can be minimized through fertilizing and cultural methods that maintain rice plants in a vigorous condition. A good way to stimulate new root growth and control rice water weevils is to drain the field and let the soil dry. Chemicals are available to control rice water weevils.

Kernel Smut

Kernel smut, another fungus disease of rice that has caused losses in the South, can be detected only on nearly mature heads. At this stage, part or all of the starchy material of each affected kernel has been replaced by a black mass of smut spores. Releasing some smut spores from within discolors the hulls (fig. 9). Generally, only one to eight smutted kernels are found on a head.

The smut is detected most easily after rain or in early morning after a heavy dew. Moisture causes the dark mass of spores to swell and

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Figure 9.—Kernel smut. Release of smut spores from affected kernels discolors the hulls and the milled rice.

break out between or through the hulls. Spores that have not yet broken out can be seen through the wet hulls. Kernel smut does not destroy the rice embryo, and diseased seed generally germinate even if all the endosperm has been replaced by smut spores.

High rates of nitrogen fertilizer increase the incidence of smut. Cultivars of rice seem to differ in susceptibility. The medium-grain varieties, except Nato, show less smut. Most current long-grain varieties are susceptible.

Straighthead

In straighthead, rice heads remain upright at maturity because the few grains formed are too light to bend them over normally (fig. 10). The diseased heads often contain no fertile seed. Usually the hulls are distorted into a crescent or

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Figure 10.—Straighthead. The rice has matured, but most of the heads contain so few grains that they remain upright.

"parrot beak" form (fig. 11). This distortion is especially conspicuous in the long-grain varieties. One or both of the hulls may be missing. Other parts of the flower also are absent frequently. In severe cases, plants fail to head or the heads are much smaller than normal and emerge slowly or incompletely from the boot. Affected plants continue to grow, remain green, and frequently produce shoots from the lower nodes.

Seed from fields affected by straighthead frequently show a low and abnormal germination, such as two sprouts from one grain. Apparently straighthead results from an abnormal soil condition that develops around the roots of the rice plant after several weeks of flooding. Straighthead frequently occurs on sandy loam soils but seldom on clay soils. Often, it occurs when the soil contains excessive nondecayed vegetation that had been plowed under. On limited areas, straighthead has been caused by arsenic that accumulated in the soil as a result of repeated applications of arsenic-containing insecticides to cotton.

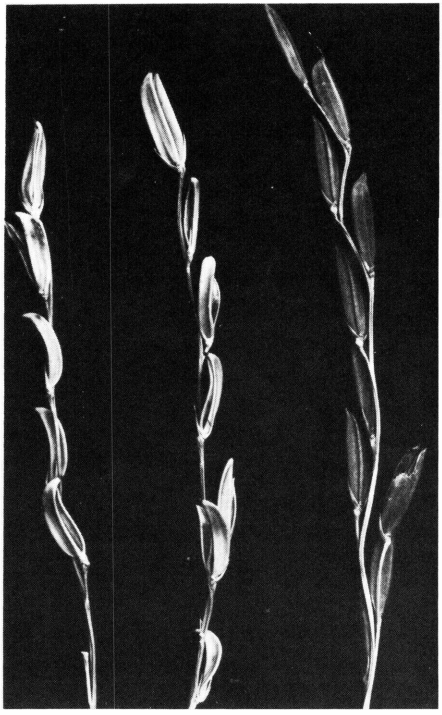

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Figure 11.—Straighthead. The two branches at the left have sterile florets with distorted hulls. The third is normal.

Straighthead generally occurs only in spots scattered through a field of rice that is otherwise normal. Losses vary from slight to nearly complete in affected fields.

Rice varieties vary in their susceptibilities to straighthead (see table 2, p. 19). On land where rice is subject to straighthead, only the more resistant varieties should be sown.

Ricegrowers in the Gulf States have controlled straighthead in susceptible varieties for many years by draining the fields just before growth reaches the shooting stage. Fields of 'Dawn', for instance, should be drained about 52 days after emergence.

MINOR RICE DISEASES

Narrow Brown Leaf Spot

Narrow brown leaf spot, sometimes known as cercospora leaf spot, may be the most prevalent disease of rice in the Gulf States. This disease varies in severity from year to year. It generally becomes more severe as the rice approaches maturity.

The leaf spots are long and narrow (fig. 12) and light brown or brown. If disease is severe, the leaves die, one after another, until hardly any remain. This disease tends to be most severe in areas suffering drought stress, such as high spots in otherwise flooded fields. Different races of the fungus causing this disease may damage certain rice varieties that are resistant to other races. Because the prevalence of individual races varies from year to year in relation to that of other races, a rice variety may show resistance to narrow brown leaf spot in a certain place for several years and then succumb to it.

White Tip

White tip is caused by a nematode, or eelworm, that is too small to be seen without a microscope. Tips of the affected leaves turn white and later become frayed and dark. Parts of the leaf other than the tip also may show light or white areas. The symptoms become most conspicuous, particularly on the flag leaf (top leaf), just before heading. The flag-leaf blade and sheath often are twisted so that the head is held within the boot (fig. 13). Severely affected plants have stunted heads that produce little grain, which are abnormally shaped.

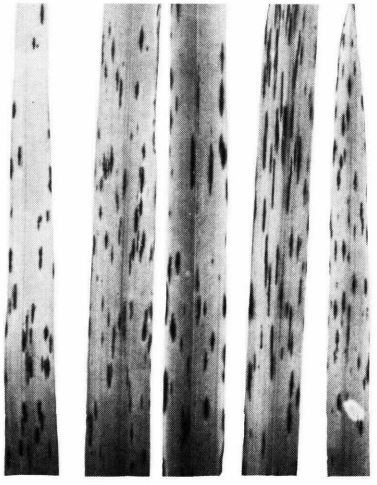

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Figure 12.—Narrow brown leaf spot.

Nematodes that cause white tip are carried on the seed. These nematodes do not live in the soil over the winter. Those found on mature rice seed are either on the inner hull surfaces or on the kernel. None get inside the kernel.

The nematodes remain dormant during the months between harvest and seeding. When an infested seed is sown in warm, moist soil, the nematodes on it become active and move into the growing point of the young rice plant. There, they feed and rapidly increase in numbers. Their feeding on the young leaf or on the developing head in the boot results in the symptoms described.

At heading, the nematodes establish themselves inside the rice flower and remain there while the grain forms. As the grain matures, they become inactive. Dormant nematodes may remain viable for 2 years on rough rice in storage.

Rice varieties differ greatly in resistance to white tip. This disease can be controlled simply by growing only varieties known to be resistant. Generally, long-grain varieties are resistant and short- or medium-grain varieties are susceptible.

During the growing season nematodes may be carried by floodwater from one field to another. The

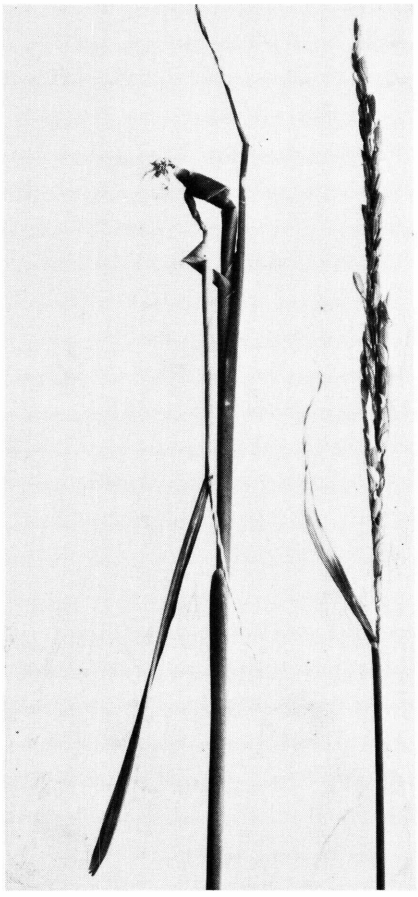

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Figure 13.—Heads of rice plants affected with white tip.

absence of typical symptoms usually indicates resistance. Seed of known susceptible varieties that are free of white tip nematodes can be obtained from fields that show no signs of infection.

No chemical treatment for control of white tip is recommended. In Arkansas, white tip has been controlled by seeding in water and keeping the field flooded.

Leaf Smut

Leaf smut (fig. 14) is a minor fungus disease of rice in which small, slightly raised black spots, called sori, develop on the leaves and, to a lesser extent, on the sheaths and stalks. These spots contain black spores of the smut fungus. Infection often is heavy enough to kill the tips of the leaves. When the spores have matured, the sori break open, liberating them. Leaf smut appears rather late in August or in September. No control measures are warranted.

Sheath Spot

This disease is similar to sheath blight and is caused by a related fungus (fig. 15). Sheath spot usually occurs in patches a few feet in diameter and is confined to the sheaths. Sheath blight and sheath spot were not separated until recently. Rarely are sclerotia of the sheath spot fungus observed. They

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Figure 14.—Leaf smut.

form within the sheath tissue and are salmon-pink, in contrast to brown sclerotia formed outside the sheath by the sheath blight fungus.

Kernel Spots

Several types of kernel spots are found on rice. Many fungi cause rice kernels to be spotted, stained, or otherwise imperfect. Generally, the same fungi cause heavy spotting or discoloration of the hulls. Kernel spotting increases in damp or warm, rainy weather and in rice that matures late in the season. Punctures of the developing kernel by the rice stink bug, plus growth of fungi in the injured areas, result in a type of kernel spot called pecky rice.

The presence of spotted or stained kernels reduces the grade of rice. Kernels that are spotted severely and therefore chalky break into pieces in the milling process; thus, kernel spot reduces yield of head rice.

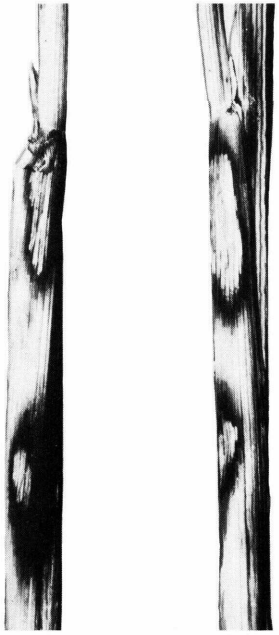

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Figure 15.—Sheath spot.

Sheath Rot

This disease recently was found in Louisiana and Texas and so far has done little damage. There have been reports from the Far East of 3 to 20 percent damage by sheath rot. Symptoms of this disease usually appear first as oblong or irregular grayish-brown lesions, about a centimeter long, on the flag-leaf sheath. They enlarge and often coalesce, sometimes affecting the entire sheath. Young panicles fail to emerge or only partially emerge from the boot, where they are rotted by the fungus. Sheath rot frequently is associated with stem-borer damage.

Leaf Scald

Leaf scald was found in Louisiana and Texas for the first time in the early 1970's, having been reported in Central America in 1960. Although it has caused some damage in Japan and in Latin America, it is unimportant in the Southern United States. This disease usually appears near the tips or margins of mature leaves as diamond-shaped or oblong water-soaked blotches with alternating olive and brown narrow bands. The lesions enlarge, often coalescing to cause the leaf to dry and turn to a bleached straw color with faint zonation. Most U.S. varieties probably are susceptible to leaf scald. The varieties 'Nato', 'Bluebonnet', "Magnolia', and 'Zenith' were attacked se-

verely in Central America, and these varieties are in the parentage of many current U.S. commercial varieties.

False Smut

False smut was last reported in the United States in the early 1900's, until 1973 when it was observed in Louisiana. It is present in most major rice-growing areas of the world but rarely has caused much damage. The fungus infects individual florets and transforms the grains into velvety green spore balls, a centimeter or more in diameter. These spore balls are covered by a membrane that bursts as the balls enlarge. After the membranes rupture, the spore balls turn orange, then yellowish green or greenish black. Usually, only a few grains on a few panicles are affected. No control measures are warranted.

POTENTIAL DISEASES

Hoja Blanca

Hoja blanca, a rice disease caused by a virus that is spread by a plant hopper, has not caused losses in the United States. This disease was found in Florida in 1957 for the first time in the United States. In 1958 and 1959, respectively, it was found in south Mississippi and in Louisiana but has not been reported in the United States since then. Heavy losses have resulted from hoja blanca in Cuba, Venezuela, and other countries of Latin America, but it has been controlled effectively with resistant varieties.

The first symptom of hoja blanca is the appearance of one or more white stripes on a leaf blade, or whitening of an entire leaf blade, or mottling of a leaf in a typical mosaic pattern. The diseased plants do not reach normal height. Their panicles (heads) fail to reach normal size and often remain partly inside the sheath.

The hulls that enclose stamens and pistil turn brown and rapidly dry out. Often they become distorted. The flower parts are sterile or often are absent. Because the diseased plant produces few seeds or none, its heads remain upright instead of bending over at maturity.

Rice plants do not die as a result of hoja blanca. Normal and diseased tillers may be produced by the same plant. The second-crop tillers of an infected plant often show no symptoms.

The chances of hoja blanca becoming a major problem in the United States are remote since the insect vector that transmits the virus cannot overwinter successfully under prevailing winter conditions of the U.S. rice belt.

Bacterial Leaf Blight

This disease, caused by a bacterium, was confined to the rice areas of Asia until recently. It was first reported in several countries of Latin America in 1976, including Mexico.

Under temperate climatic conditions bacterial leaf blight usually becomes noticeable around heading time. Infection occurs through growth cracks where new roots emerge through the base of the leaf sheath, through wounds on leaves or sheaths, and through water pores on the upper leaf surface. In the

tropics, outbreaks of this disease often are associated with the typhoon season.

Lesions usually first appear at the leaf margins as water-soaked stripes and enlarge both in length and width with a wavy margin, turning yellow within a few days (fig. 16). These lesions eventually may involve the entire leaf and expand to the sheath as well. The affected leaves turn white and later become gray from the growth of secondary fungi.

Milky dew drops, made of bacterial cells suspended in dew, may be observed on the surface of young lesions in the early morning. They dry into small yellow beads that fall into the water. One method of spreading bacterial leaf blight is in irrigation water.

Figure 16.—Bacterial leaf blight. (Courtesy of S. H. Ou, The International Rice Research Institute.)

As the causal bacterium has several strains, resistant rice varieties later may become susceptible to new strains. Although bacterial leaf blight has not been reported in the United States, programs are underway to assess the vulnerability of U.S. rice lines and identify sources of resistance to this disease.

Many dollars are being spent to develop disease-resistant crops and more effective cultural practices. The results have been well worth the investment. The farmer himself, however, determines his success in producing high yields, notwithstanding bad weather. He can help to insure a good crop by choosing varieties that perform best for him; by careful field preparation, sound fertilization, and water management; and by the wise use of chemical and cultural weed and pest management.

Many dollars also are spent to prevent the introduction of crop pests into the United States from other countries. We are presently anticipating the introduction of a potentially devastating bacterial leaf blight of rice into the Southern United States. Visitors to foreign countries are warned NOT to bring seeds back to the United States or to check with the

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Federal Building
Hyattsville, Md. 20782

before bringing back seed or having seed shipped into the United States. Aside from the questions of legality, you unintentionally may bring seed-borne disease-causing organisms into an agricultural area where little or no resistance has been developed in the crops.

TABLE 1.—*Rice diseases, organisms that cause them, and control measures*

Disease	*Causal organism*	*Control measures*
Principal diseases:		
Seedling blight and damping-off.	Drill-seeded: *Helminthosporium oryzae, Pythium* spp., *Fusarium* spp., *Rhizoctonia solani* Kuhn *Sclerotium rolfsii* Sacc. Water-seeded: *Achlya* spp. and *Pythium* spp.	Seed treatment, shallow seeding if drilled in early spring, flooding.
Blast	*Pyricularia oryzae* Cav	Resistant varieties, early seeding, flooding, foliar fungicides.
Brown leaf spot	*Helminthosporium oryzae* B. de Haan (*Bipolaris oryzae* Ellis).	Cultural practices.
Sheath blight	*Rhizoctonia solani*	Resistant varieties, nitrogen timing, grass control, crop rotation.
Stem rot	*Sclerotium oryzae* Catt	Resistant varieties, balanced fertilizing, draining, crop rotation, foliar fungicides.
Kernel smut	*Neovossia horrida* (Tak.) Padwick & Azmt. Khan.	Nitrogen fertilizer, resistant varieties.
Root rot	Fungi including *Rhizoctonia solani, Pythium* spp. and *Fusarium* spp.; Nematodes including *Tylenchorhynclus martini* Fielding, *Hirchmanniella oryzae* (B. de Haan) Luc & Goodey, and *Meloidogyne* sp.; rice water weevil larvae (*Lissorhoptrus oryzophilus Kuschel*).	Crop rotation, balanced fertilizing, other cultural practices, draining.
Straighthead	Physiological disease	Resistant varieties, draining.
Minor diseases:		
Narrow brown leaf spot.	*Cercospora oryzae* I. Miyake	Resistant varieties, early maturing cultivars.
White tip	*Aphelenchoides besseyi* Christie	Resistant varieties, disease-free seed, water seeding and continuous flooding.

TABLE 1.—*Rice diseases, organisms that cause them, and control measures*—Continued

Disease	*Causal organism*	*Control measures*
Leaf smut	*Entyloma oryzae* H. & P. Syd.	None.
Sheath spot	*Rhizoctonia oryzae* Ryker & Gooch.	Resistant varieties, timing of nitrogen, crop rotation.
Kernel spots	Various fungi, including *Trichoconis padwickii* Ganguly, *Helminthosporium* spp., *Curvularia* spp., *Alternaria* spp., *Fusarium* spp., rice stink bug (*Oebalus pugnax* (Fabricius)).	None except insect control.
Sheath rot	*Sarocladium oryzae* (Saw.) W. Gams & D. Hawksw. (=*Acrocylindrium oryzae* Sawada).	None.
Leaf scald	*Rhynchosporium oryzae* Haskioka & Yokogi.	None.
False smut	*Ustilaginoidea virens* (Cke.) Tak.	None.
Potential diseases:		
Hoja blanca	Virus transmitted by a planthopper (*Sogatodes oryzicola* (Muir)).	Resistant varieties.
Bacterial leaf blight.	*Xanthomonas oryzae* (Uyeda & Ishiyama) Dowson.	Resistant varieties.

TABLE 2.—*Disease resistance and susceptibility of common U.S. commercial rice varieties*[1] [2]

Variety	C.I. No.	Diseases										
		Rice blast races				Brown leaf spot	Sheath blight	Stem rot	Narrow brown leaf spot	Straight head	White tip	Bacterial leaf blight
		IB–45	IC–17	IG–1	IH–1							
Bluebelle	9544	MS	S	MS	R	MR	VS	S	S	R	R	VS
Bonnet 73	9654	MS	S	R	MS	MS	MS	S	R	MR	R	S
Brazos	9875	S	S	S	S	MS	MS	MS	R	MR	MR	S
Caloro	1561–1	S	S	S	VS	S	MR	MS	R	S	S	MS
Calrose	8988	S	S	S	S	S	----------		S	S	S	----------
Colusa	1600	S	S	S	S	S	MS	MS	R	S	S	S
Dawn	9534	R	S	R	R	MR	VS	S	MS	VS	R	S
Della	9483	S	S	S	R	MR	S	--------	S	S	R	----------
LA 110	9962	R	R	R	R	MS	MS	S	R	S	--------	MS
Labelle	9708	R	S	R	R	MS	VS	S	MS	R	R	S
Lebonnet	9882	R	S	R	R	MR	VS	VS	S	R	R	S
Mars	9945	MS	R	R	R	MS	MS	MS	R	MR	R	R
Melrose	[3]	MR	R	MR	S	VS	MR	VS	R	MR	--------	MR
Nato	8998	S	S	S	S	MS	MS	S	MS	S	S	S
Newrex	----------	R	MS	R	R	MR	MS	S	MS	S	R	S
Nova 76	9948	MS	MR	R	MS	S	MS	MS	MS	MS	S	S
Nortai	9836	MR	R	MS	R	MS	MR	MS	R	R	R	MS
Saturn	9542	S	R	R	R	S	MS	VS	VS	S	R	S
Starbonnet	9584	MR	S	S	R	S	S	S	S	MR	R	S
Vista	9628–2	S	R	R	R	MS	MS	MS	MR	MR	S	S

[1] Key to symbols: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=susceptible, VS=very susceptible.

[2] Ratings represent the latest available information from disease nurseries and field observations by pathologists in the Southern United States, Latin America, and Asia. The cooperation of M. C. Rush and coworkers, Louisiana State University, is gratefully acknowledged.

[3] 'Melrose' is a medium-grain cultivar released in 1976 by Alexandria Seed Co., Alexandria, La., selection No. AS–1004.

U.S. GOVERNMENT PRINTING OFFICE : 1979 O - 276-688